1996. The Journal of Arachnology 24:135–140

SPIDERS ASSOCIATED WITH EARLY SUCCESSIONAL STAGES ON A VIRGINIA BARRIER ISLAND

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ABSTRACT. Communities consisting of small shrubs and larger pre-thicket plants of *Myrica cerifera* (Myricacae) and *Baccharis halmifolia* (Asteraceae) were sampled by sweepnet in early June, July and August of 1995 to estimate the density and diversity of spider communities associated with these shrubs during early successional stages of thicket development. This was initiated as part of a larger study intended to determine establishment patterns of these two shrubs in graminoid dominated swales (low-lying wetlands between dune ridges). The species *Hentzia palmarum* (Hentz 1832), *Eris flava* (Peckham & Peckham 1888) (Araneae, Salticidae) and *Misumenops celer* (Hentz 1847) (Araneae, Thomisidae) were common to both *Myrica* and *Baccharis*; however, densities differed between shrubs. *Habronattus agilis* (Banks 1893) (Salticidae) was uncommon and only found on *Myrica* while the infrequent species *Poultonella alboimmaculata* (Peckham & Peckham 1883) (Salticidae) was only found on *Baccharis*. The greatest differences in spider densities were between the early transitional swale site and the developing thicket (later transitional swale) site. Insect communities sampled had greater observed differences in structure between the two shrubs than were found with spiders.

Much of the work dealing with spiders and spider assemblages has focussed on the role of spiders as predator control agents in both natural and man-altered ecosystems (Reichert & Lockley 1984; Nyffeler et al. 1987; Reichert & Bishop 1990). Less-studied aspects of spider ecology are the habitat requirements of species and the dynamics of guild structure in natural habitats.

While many spiders may be generalist predators, many species may have fairly strict habitat requirements. Species may segregate by habitat or be cryptically adapted to hunt on selected plant substrates (Döbel et al. 1990; Coetzee et al. 1990; Cutler 1992; Cutler & Jennings 1992). Spiders in selected habitats may also utilize woody plants as habitat islands (Ehmann 1994).

On mid-Atlantic barrier islands, vegetation behind the foredune grades from xeric grass dominated communities into graminoid dominated swales. Established swales are soon colonized by waxmyrtle (*Myrica cerifera*) and groundsel tree (*Baccharis halmifolia*). These plants in the colonizing swale are found as widely scattered small individuals or as part of larger clumps containing both *Myrica* and *Baccharis*. As the island ages, *Myrica* and *Baccharis* in the older swales gradually develop into a thicket. Immature thickets contain large *Myrica* (1–2 m canopy spread) and scattered smaller (0.25–1 m canopy spread) individuals of both *Myrica* and *Baccharis*. While many *Myrica* plants are large, there is no continuous canopy coverage as is found in the mid-island or bay-side thickets (Young et al. 1995).

In the most recently established swale, many individuals of both *Myrica* and *Baccharis* show visible signs of herbivory (pers. obs.). Such herbivory may alter the ultimate composition of the thicket community by restricting growth of certain plants or by eliminating individuals (Kraft & Denno 1982; Krischik & Denno 1990). Spiders associated with *Myrica* and *Baccharis* may in turn alter insect distribution and density such that impact of herbivory may be lessened and plants are better able to compete (Crawley 1983; Reichert & Lockley 1984).

The purpose of this study was to 1) investigate spider species and composition of assemblages associated with small and pre-canopy-closure plants of *Myrica cerifera* and *Baccharis halmifolia*, and 2) estimate seasonal

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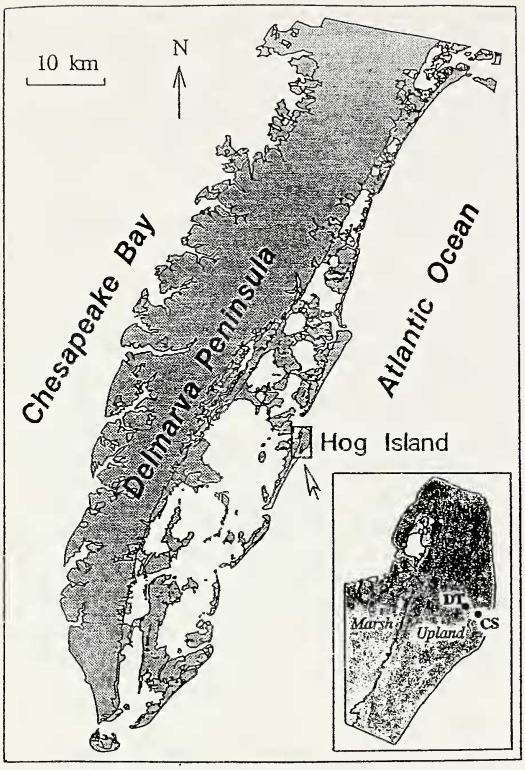

Figure 1.—The Virginia portion of the DelMarVa peninsula and the associated barrier islands which make up the Virginia Coast Reserve. The two field sites, developing thicket (DT) and colonizing swale (CS), are shown on the insert depicting the north half of Hog Island.

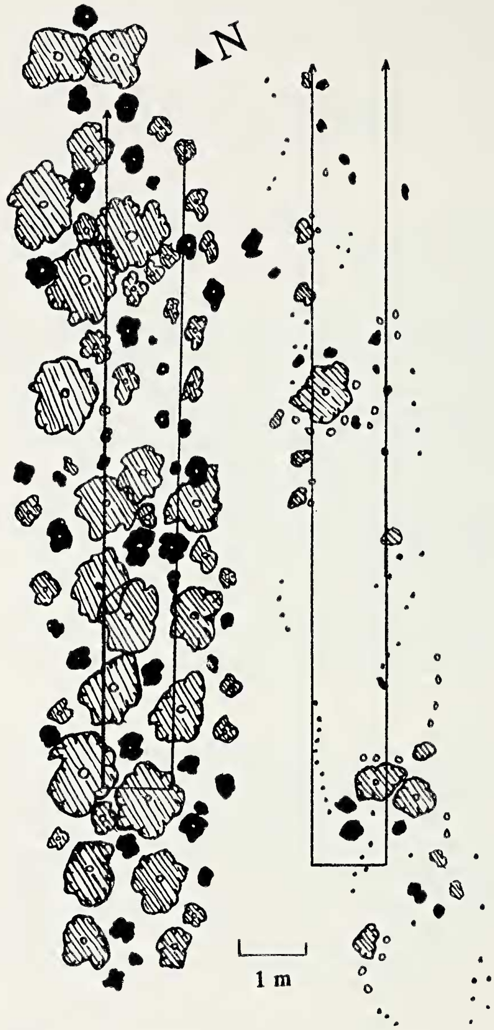

Figure 2.—Depiction of the developing thicket (on the left) and the colonizing swale (right) showing the relative density of plants and pattern of sweep sampling. *Baccharis* plants are shown in solid black. Large and medium *Myrica* plants are shown with crosshatching; small plants are left clear.

patterns of distribution and density of the most common spiders and potential prey insects on these shrubs. This study represents a portion of a larger study designed to determine the dynamics of colonization of *M. cerifera* and *B. halmifolia* on newly established barrier island swales.

METHODS

Study sites.—Field work was conducted on Hog Island (37°40′N, 75°40′W). This island is part of the Virginia Coast Reserve and is the primary LTER site within the VCR (Dueser et al. 1976; Hayden et al. 1990). The north end of Hog Island is actively accreting while the south end of the island is eroding. Shrub thickets are well developed along the middle of the island and along the bay side. Due to the creation of new swales at the north end, new thickets are forming east of the mid-island thicket (Young et al. 1995). Therefore, to estimate spider and insect densities and distributions on developing shrub thickets on barrier islands, four distinct sites were selected which included developing shrub thicket and early transitional swale. These communities are separated by a well developed xeric dune ridge (Figs. 1, 2).

Spiders and insects were collected with a sweepnet. Unidentified species were preserved in alcohol and sent to Bruce Cutler at the University of Kansas for identification.

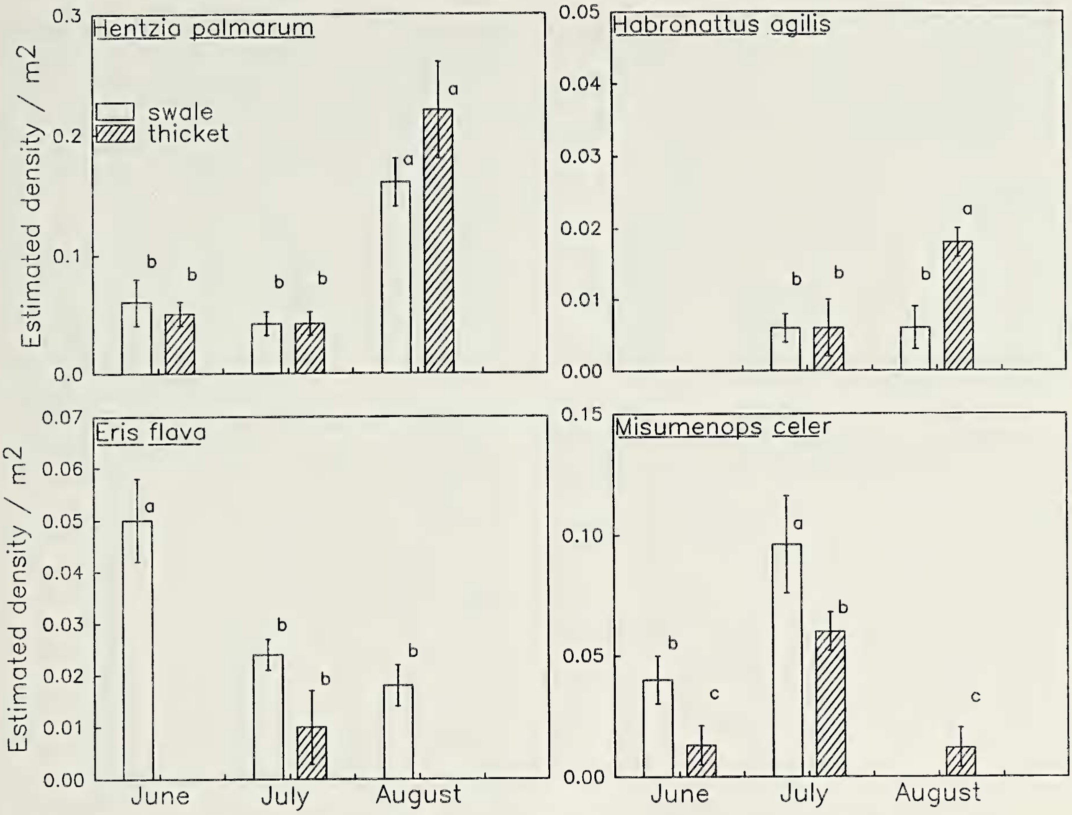

Figure 3.—Estimated densities of the four primary species composing the spider guild on *Myrica cerifera* in June, July and August of 1995. Vertical bars indicate one standard error of the mean. Letters indicate significant differences ($P < 0.05$) in density between site.

Most insects were identified using field guides (Borror & White 1970; Helfer 1987). Ants were identified by Deborah Waller at Old Dominion University. Voucher specimens of the spiders are located at the University of Kansas.

Four sweepnet samples were taken at each of the four study sites along linear transects running parallel to the dune ridge. These 16 samples were equally divided between the developing thicket and the early transitional swale and included sweeps of 100 *Myrica* or *Baccharis* plants in either habitat (Fig. 2). This 16 sample collection procedure was repeated in early June, July and August, 1995. Density of *Myrica* and *Baccharis* shrubs at both study sites were counted using 15 quadrats, each five m^2, delineated with corner posts and a tape measure. The estimated density of spiders and prey was then determined by multiplying the number of individuals per plant (total *n*/100) by the density of plants/m^2. This method gives an estimate of spider and prey insect density/m^2.

Two samples (50 sweeps/sample) were also taken in the graminoid dominated areas of the colonizing swale around individual *Myrica* and *Baccharis* plants in June, July and August. These additional samples were taken to survey spider and insect species diversity in swales and to qualify any overlap of species between swale graminoids and shrubs.

Data for spider and insect density changes with season were analyzed by 2-way ANOVA (site × season) in SAS using an $\alpha = 0.5$ (Zar 1984; SAS Institute 1988).

RESULTS AND DISCUSSION

Density of spiders on both shrubs was highest in August. This increase from the previous two measurement periods was primarily due because of the increase in density of *Hentzia palmarum* (Araneae, Salticidae) (Figs. 3, 4). There were no differences in density in *Hen-*

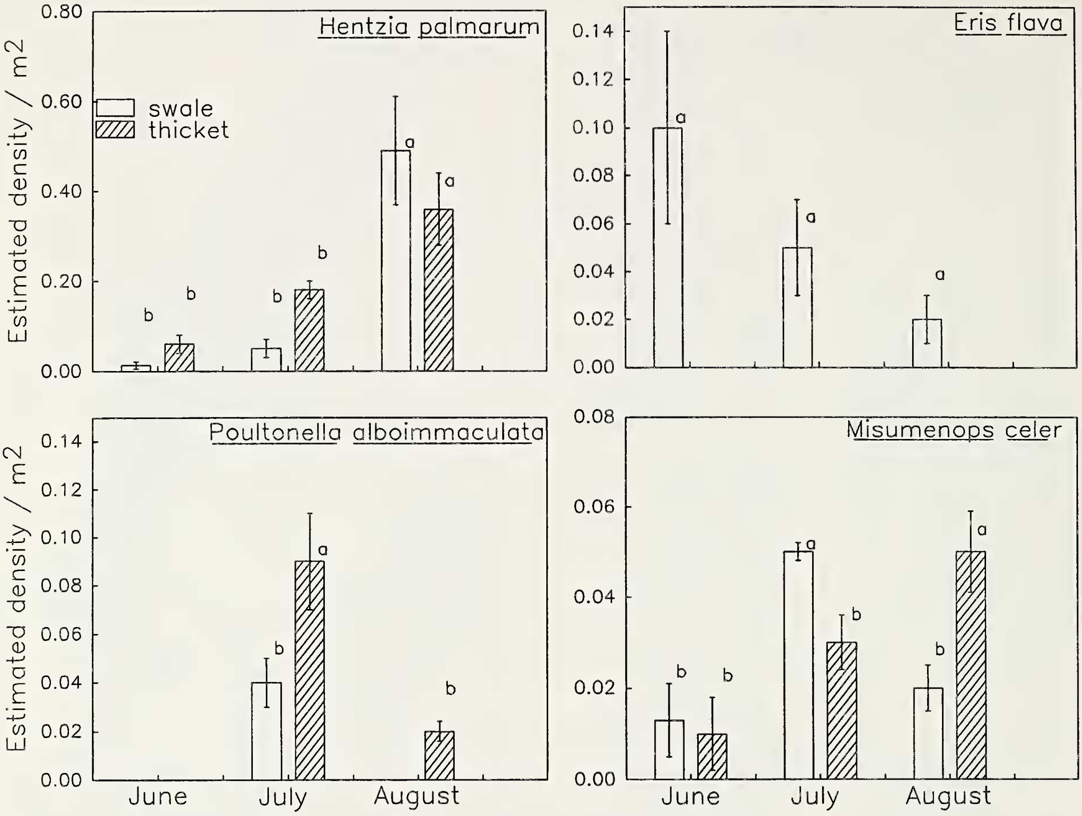

Figure 4.—Estimated densities of the four primary species of the spider guild on *Baccharis halmifolia* in June, July, and August. Vertical bars indicate one standard error of the mean. Letters indicate significant ($P < 0.05$) differences in density between sites.

tzia palmarum on *Myrica* between habitats. On *Baccharis*, *H. palmarum* was more common in the developing thicket but was more evenly divided between habitats in August. Similarly to *H. palmarum*, *Habronattus agilis* (Araneae, Salticidae), also showed significantly ($P < 0.05$) higher densities in August. It was only found on *Myrica* and was most frequently captured in the developing thicket (Fig. 3).

Misumenops celer (Araneae, Thomisidae) had the highest density of individuals on both *Myrica* and *Baccharis* in July. On *Myrica*, *Misumenops celer* had significantly ($P < 0.05$) higher density in the early transitional swale. This pattern was also evident for *Baccharis*; however, there was no significant difference in density between the sites. Also on *Baccharis*, *M. celer* had significantly ($P < 0.05$) higher density in plants of the developing thicket (Fig. 4).

Eris flava (Araneae, Salticidae) was also found on both *Myrica* and *Baccharis* but was primarily found in the early transitional swale site. While it was found on *Myrica* in the developing thicket, it was never found there on *Baccharis*. The changes in density of *E. flava* from June to significantly ($P < 0.05$) lower densities in July and August show a trend opposite to that found for *Hentzia palmarum* and perhaps also *Habronattus agilis*.

Eris flava may have been more common on *Myrica* and *Baccharis* plants in the early transitional swale because it was a prominent member of the surrounding graminoid community. In these areas, *E. flava* was found in a density of 21 individuals/100 sweeps in June, 30/100 sweeps in July and 45/100 sweeps in August. These numbers are not expressed as a density/m^2 because an intensive study of the swales was beyond the scope of this study. Nevertheless, the apparent increase in estimated density suggests a trend opposite to that found on *Myrica* and *Baccharis* over the measurement period. *Eris flava* may have been responding to a rapid increase in juvenile planthoppers (unidentified) which were found in density of 62 individuals/100 sweeps among graminoids in August. Other spiders of the graminoid dominated swale community were, in order of highest to lowest density, *Mangora gibberosa* (Hentz 1847) (Araneae, Araneidae), *Tetragnatha versicolor* Walckenaer 1981 (Araneae, Araneidae), *Marpissa pikei* (G.& E. Peckham 1888) (Araneae, Salticidae) and *Tibellus oblongus* (Walckenaer 1802) (Araneae, Philodromidae).

Another prominent component of the spider community on *Baccharis* was *Poultonella alboimmaculata* (Araneae, Salticidae). Like *M. celer*, *P. alboimmaculata* had the highest estimated density on *Baccharis* in July; however, it was not found in June and was found in very low numbers in August (Fig. 4). This species has been found in the upper midwest and on the east coast in New York State but has not been previously observed on the Virginia barrier islands (Cokendolpher & Horner 1978; Steitenroth & Horner 1987). Therefore, this may represent a new southeastern record for the species (J. C. Cokendolpher & B. Cutler, pers. comm.). These *P. alboimmacultata* were also found most commonly associated with the ants, *Forelius pruinosus* (Roger) in the early transitional swale and with *Crematogaster clara* Mayr in the developing thicket. While *Dolichoderus mariae* Forel was as common on *Baccharis* as *Crematogaster clara*, *P. alboimmaculata* was never found associated with that species.

The most common insect on *Myrica* at both sites was the tree cricket *Oecanthus fultoni* T. J. Walker (Orthoptera, Gryllidae, Oecanthinae). *Oecanthus* was found in high density in June and July. The density of *O. fultoni* was significantly ($P < 0.05$) lower in August (Table 1). *Oecanthus fultoni* was also found on *Baccharis* but occurred there only sporadically and in minimal numbers. The most common insects on *Baccharis* were *Trirhabda bacarhidis* (Chysomelidae), aphids (unidentified) and five species of aphid-tending ants. Among the ants, *Dolichoderus mariae* Forel, *Crematogaster clara* Mayr and *Forelius pruinosus* (Roger) were the most common. Further description of the ant communities was beyond the scope of this study.

In conclusion, the spider communities associated with *Myrica* and *Baccharis* are very similar in species diversity but chiefly differ in density with *Baccharis* supporting fewer individuals. Both shrubs growing in the early transitional swale share one species, *Eris flava,* with the surrounding swale community. Generally spider diversity and density differed most between sites rather than between shrub species. Though species were generally identical for both shrubs, the rare jumping spider *Poultonella alboimmaculata* was only found on *Baccharis*.

Table 1.—Estimated densities of *Oecanthus fultoni* Walker on *Myrica cerifera* at the colonizing swale and developing thicket sites. Numbers represent the mean ± one standard error. Letters (a, b) indicate significant ($P < 0.05$) differences in density.

	Developing thicket	Colonizing swale
June	5.1 ± 2.3^a	3.4 ± 1.6^a
July	8.6 ± 3.3^a	3.7 ± 2.0^a
August	0.3 ± 0.12^b	0.4 ± 0.17^b

ACKNOWLEDGMENTS

I thank Donald R. Young and Kathy Tolliver for support and inspiration for this project.

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Manuscript received 26 September 1995, revised 9 May 1996.